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THE REALIZATION OF MIND

THE LANGUAGE OF BRAIN, BEHAVIOR AND MIND

When I began investigating the relationship between brain function and behavior I was sure that this sort of research would eliminate mentalism from psychology, much as biochemistry had eliminated vitalism from biology. Today, the experimental results that accrued have eroded this assurance to a point where a somewhat different position has evolved. I want to share with philosophers my current views, in part to stimulate discussion, in part to find out what if any major approach to the problem I am ignoring. Thus this paper.

Let me for the sake of simplicity and clarity claim that essentially there are currently two major theoretical approaches to the mind-brain problem, though many different and subtle modifications of each has been proposed. These approaches can be codified as (1) an identity stance which in one sophisticated form encompasses the pluralistic 'multiple aspect' view popular with critical philosophers, and (2) the dualistic stance derived from Descartes. Each position is logically defensible and sheds some light on the problem. I will maintain here, however, that each is incomplete and propose an alternative, different in its content and aim. I will call this alternative the Biologist View on the problem. But first let me briefly review some of the arguments for the classical theories as I conceive them.

Identity theory holds that mental phenomena and physical (usually brain processes) are identical. Many philosophers in the Anglo-American tradition espouse this position. They point out that the language we use to describe events may be derived from physiological or behavioral observation or from social communication about introspective evidence. Each language, however, deals with the same basic 'event-structure' but comes at it from its own aspect. A plurality of aspects can thus be conceived to portray the basic identity. Although philosophers who espouse this view would perhaps never directly admit to this, the identity

referred to by these aspects must be either 'real' or 'ideal' in the Platonic sense. If 'real', experiments and observations ought to be able to disclose the commonalities indicated by the aspects. This is in fact what we as scientists try to do. However, as we have found out from studies of brain function, what is perceived as 'real' has to be constructed by the brain's control over the sensory process. 'Reality' as a construction is thus not altogether different from another construction which we might call 'ideal' just because of the level of abstraction attained. But as Quine (1960) has shown clearly, constructions are languages and languages are to some extent mutually untranslatable. The dilemma of the identity theorist is therefore that he can never reach that which is assumed identical without construction which entails an additional language, an additional aspect which though it may subsume others can never become itself identical with them. The identity theorist thus ends up as a pluralist, identity remaining an unachieved goal. This does not mean that identity theory is totally wrong. Just that it cannot satisfy except as a belief that a monistic explanation is worth striving for.

THE WORLD OF LANGUAGES

Dualistic theory does not fare much better. Since Descartes an emphasis has been placed on the distinction between the phenomenal, subjectively experienced, and the objective world which can be instrumentally validated. Dualism ought not to be dismissed out of hand for it points up an important distinction. There is a difference between the subjective and the objective constructions we experience, a difference between the 'phenomenal' and the 'real' world. The difference lies in how each becomes validated. Empiricists have emphasized the fact that we perceive the world through our senses. Empirical studies enhance these perceptions through instrumentation that augments and refines the senses. The physical, the 'real' world is constructed by us from detailed descriptions fed to our senses that achieve information about the world. On the other hand, the phenomenal, the 'ideal' world is a world of ideas. We validate experience in this world through social communication, through enactment, through communicative acts. In science this distinction between real and phenomenal becomes externalized in a distinction between descriptive and normative, between more or less certain facts and those

which are completely dependent on convention. A systems approach gives a feel for the way in which the distinction has come about and its usefulness. On another occasion I stated the matter as follows:

... I believe that... the behavioral, biological-social scientist interested in the mind-body problem finds his universe to be a mirror image of the universe constructed by the physical scientist who deals with the same problem. And it should not come as a surprise when each of these mirror images, these isomers, the one produced by the physicist and the one produced by the behavioral scientist, on occasion display properties that differ considerably from one another, much as do optical isomers in organic chemistry.

I believe these images are mirrors because of differences in the direction generally pursued from each investigator's effective starting point, his own observations. The physical scientist for the most part, constructs his universe by ever more refined analysis of input variables, that is, sensory stimuli to which he reacts. The form of the reaction (cathode ray tube, solid-state device, chromatography, or galvanometer) is unimportant, except that it provides a sufficiently broad communicative base. Constancies are gradually retrieved from manipulations and observations of these input variables under a variety of conditions. As these constants achieve stability, the 'correctness' of the views that produced them is asserted: the ['real'] physical universe is properly described.

In the social disciplines the direction pursued is often just the reverse. Analysis is made of *action* systems. The exact nature of the input to the actor (including the observing scientist) is of little consequence, provided it has sufficient communicative base; the effect of action on the system is the subject of analysis. It matters little (perhaps because the cause is usually multiple [overdetermined] and/or indeterminable) if a currency is deflated because of fear of inflation, depression, personal whim, or misguided economic theory. The effects of deflation can be studied, are knowable. And once known, the action becomes corrective; the resulting stabilization, constancy, is interpreted as evidence for the [practical, pragmatic] 'correctness' of the action that produced the correction. Appropriate norms for the social universe become established.

One striking difference between the two images thus formed is immediately apparent. The physicist's macroscopic universe is the more stable, predictable one: "It does not hurt the moon to look at it" (Eddington, 1958, p. 227). For the most part, it is as he moves to ever more microscopic worlds that uncertainties are asserted. [By contrast] the scientist concerned with social matters finds it just the other way around: it seemingly does little harm to the man to look at him; but seriously look at his family, his friendships, or his political-economic systems and what you had started out to look at changes with the looking. Here indeterminacy comes to plague the macrostructure; it is in the stabilities of microanalysis that the mirage of safety appears.

...

The problem can be grasped... if it is dealt with in terms of isomeric forms of the same event universe – isomers differing in that their *structures* mirror each other. Put another way, the problem resolves itself into a meshing of the descriptive and the normative sciences. The suggestion is that structure in descriptive science ordinarily emerges from the analysis of the relations between systems and their subsystems; that

in the normative sciences, it goes in the opposite direction: structure emerges when the relation between a system and its 'supersystem' is studied.

If this view is correct, we should find normative statements about the nature of the physical world when these are constructed from the examination of relations between a set of systems and a higher order system. Is not relativity just this sort of statement? This is not a social scientist speaking about the 'criterion problem':

The modern observer... [is] faced with the task of choosing between a number of frames of space with nothing to guide his choice. They are different in the sense that they frame the material objects of the world, including the observer himself, differently; but they are indistinguishable in the sense that the world as framed in one space conducts itself according to precisely the same laws as the world framed in another space. Owing to the accident of having been born on a particular planet our observer has hitherto unthinkingly adopted one of the frames; but he realizes that this is no ground for obstinately asserting that it must be the right frame. Which is the right frame?

At this juncture Einstein comes forward with a suggestion –

'You are seeking a frame of space which you call the *right* frame. In what does its *rightness* consist?'

You are standing with a label in your hand before a row of packages all precisely similar. You are worried because there is nothing to help you to decide which of the packages it should be attached to. Look at the label and see what is written on it. Nothing.

'Right' as applied to frames of space is a blank label. It implies that there is something distinguishing a right frame from a wrong frame; but when we ask what is the distinguishing property, the only answer we receive is 'Rightness', which does not make the meaning clearer or convince us that there is a meaning (Eddington, 1958, p. 20).

Obversely, we should find descriptive statements about the nature of the social world when these derive from a study of the relations between a system and its subsystems. Doesn't the following passage fit this requirement?:

Role behavior depends first of all on the role positions that society establishes; that is certain ways of behaving toward others are defined by different positions (Hilgard, 1962, p. 432).

Aren't statements about roles unambiguously descriptive? (Pribram, 1965).

The problem with dualism arises not when separate 'mirror images' of the world are considered but when the question is asked: how do these worlds interact? It is the same question asked of the identity position: how can two or several linguistic constructions influence each other, how can they be translated into some common view?

The ordinary answer to that is that the mental construction intervenes in the construction of the real world. Kant especially emphasized the role of understanding, that is, of cognitive activity, in the constitution of all experience – even that of reality. Recently Sperry (1969) has suggested that intervention is not really what occurs – he prefers the term 'supervention' to describe the superordinate aspect of the phenomenal, the

mental. His emphasis is on the separateness of mind as a construction of the operations of the brain. The fact, however, that these constructions can feed back into the brain through the senses, makes the supervention position a variant, though a recognizably distinct variant, of interventionism.

Eccles has recently espoused a somewhat similar view (1970). He wants to abandon dualism in favor of a triadic explanation of the mind-body issue. He follows Popper (1968) in emphasizing the third-world nature of language and culture. Language and culture appear to have unique characteristics which are hard to define as either mental or physical. Is a computer program a physical entity or is it a mental representation? Even our law courts are having difficulty in deciding. Should complex programs which cost large sums to construct, and which are realizable in hardware, be patentable or is society better served by protecting them only with copyrights? Decisions have been made and reversed and at the time of writing appeal has been made to even higher tribunals for an answer. Popper and Eccles would claim, and rightly so, that perhaps some new legislation is in order now that the third world, the world of ideas has become realized in this directly useful and palpable mode. The triadic variant of dualism has its merit but comes into difficulty as do all variants when the interaction between the worlds is considered (see for example, the complexity of Figure 36 in Eccles, 1970).

THE BIOLOGIST VIEW — A POSTCRITICAL APPROACH

But enough of this critical analysis of the mind-body issue. Critical analysis is fun and can be useful as shown by the above discussions. But critical analysis is always incomplete. The richness of the whole issue is never truly apprehended, only glimpsed from now one, now another aspect.

I want therefore to propose an alternative to these approaches to the problem. I suggest that a biological approach is possible and that in its own fashion the biological approach is satisfying in a way a philosophical approach cannot be. Further, I suggest that the Biologist position on the mind-body problem will change man's image of himself just as did the Cartesian and identity views and that this change will have profound consequences.

I noted earlier that the Biologist View on the mind-body relationship is different in content and different in approach from the earlier views. The biologist takes his starting point from biological material, from the 'real' world of description based on observation and experiment. *The data of the Biologist position are derived from descriptive science where the data of the Cartesian and identity approaches are purely conceptual.* From Descartes' "cogito ergo sum" to contemporary academic philosophy the data to be analyzed have as a rule come directly from consciousness; whether (in dualism or idealism) from subjective experience or (in physicalism and other forms of identity theory) from highly abstract principles of science (such as uncertainty and indeterminacy) as philosophers have understood them.

One exception must be made. Modern philosophy has recognized behavior as an expression of mind. Behavior has been observed and observations analyzed. But paradoxically the experimental approach of the behaviorist has generally been ignored as providing only trivia. Elsewhere in science minute observations and detailed experiments hold the key to knowledge. Philosophers seem to believe that in behavioral analysis this route is not, or at least has not been, a fruitful one (or else they would take the behaviorist's data as their starting point for analysis).

The Biologist approach, pursued in a forthcoming volume (Pribram, 1971) does take the behaviorists' contributions seriously. A part of the book is devoted to an analysis of some of their contributions – but the analysis takes strength, I believe, from setting these contributions into a larger biological context.

There is therefore a basic difference in *method* between the Cartesian-critical tradition in philosophy and the Biologist View suggested here. This difference in method accounts for a difference in content, in the data subjected to analysis. The data of the biologist stem from science and are largely descriptive; the data of the Cartesian-critical thinkers stem from a philosophical tradition and are more obviously subject to convention.

A third difference between the Biologist View and the Cartesian-critical stems from the others: The Biologist position on the mind-body problem is post-critical (Polanyi, 1960). The biologist's data everywhere show him that structure becomes embodied in a variety of forms through processes and transformations that must be laboriously described. The fact

that mental structure (e.g. a phrase of music) can be 'realized' in brain rhythms, in the score of sheet music, on a long playing record, or on tape is not especially shocking to him. Every day he views his wife, that strange embodiment he extends himself to know only to recognize that she can be encoded in a DNA molecule – else how did his daughter turn out to be such an amazing replica? *In the Biologist View, multiple 'aspects' become multiple 'realizations' or embodiments.*

Embodiment is often a long drawn out stepwise process and each step can be detailed only after a considerable amount of observation and research. Even today, after a century of experiment, some of the steps that lead to the realization of the genetic potential remain an enigma. That small steps are involved is beyond doubt, however. A dramatic example of the incremental nature of 'translating' one form into another is given by experiments aimed at delineating the relationship between genetic potential and culture. To this end Calhoun (1956) in the laboratories at Bar Harbor, Maine studied two strains of mice. One of these strains inhabited terraced apartments constructed of earth and herbaceous debris. Socially dominant mice maintained penthouses, the *hoi polloi* of the mouse world lived below. The second strain of Calhoun's mice was nomadic. Apartment dwelling was not for them. They dug small burrows to come in from the rain and cold, moved on when these became soiled or otherwise unusable. Calhoun asked the question: is apartment construction and habitation an inborn trait or is this complex social organization culturally transmitted? To answer the question he took newborn infants from each strain and cross-fostered them by the mother of the opposite. Exchanging newborns between strains was not in itself sufficient, however, to answer the question. Sets of cross-fostered infants had to be separated from parental influence at weaning and raised so that communication would occur only with unacculturated others, thus only with mice who had also been cross-fostered. Colonies of offspring of these cross-fostered strains were thus founded, the strains being kept carefully separated. Biology took its course and many generations of offspring of mice were observed.

The result of the experiment dramatically demonstrated the nature-nurture relationship. Cross-fostered mice of the apartment dwelling strain did not build apartments right off. The first and even the second generation social structures developed by these mice were hardly dis-

tinguishable from those of the cross-fostered nomads. Calhoun noted one small difference, however. Nomadic mice distributed the dirt of their digging helter skelter. Apartment mice made neat piles of such diggings. In fact, over successive generations, the piles became somewhat taller and provided small hills for dominance play and struggle.

To cut a long story short, after some 15-20 generations but not before, the apartment culture was reestablished full blown by apartment mice; nomads remained levellers both architecturally and socially. The genetic primordium for the apartment culture consisted of hillock construction from diggings. The full blown complexity of the culture became actualized only after generations of transmitted cultural achievement.

The achievement of a culture is thus dependent on the way in which behavior becomes organized by the brain. No one is tempted to identify the culture with brain, yet, in a sense, such identity is admissible. Calhoun's apartments devolved from the structure of DNA in a strain of mice; without their special brains these mice would not develop the apartment culture. The accomplishment is in a sense already contained in the mouse brain and in his DNA.

Yet this simple identity statement leaves one vaguely dissatisfied. In fact, most statements of the nature-nurture issue, which is what we are now talking about, leave too much unsaid. Brain with its capacity for recording and remembering experience is the obvious bridge but another problem is immediately encountered. Man's language allows him to talk about himself and the talk is often phrased in terms of man's 'mind'.

Is it not therefore legitimate to discuss some cultural observations in mental language? Is it not legitimate to ask whether a social hierarchy is maintained because some individuals are made to 'feel' superior to others? When the individuals in the culture are mice one might hesitate to ask the question in these terms; when a man is being studied, why not?

Thus the Biologist View on the mind-body relationship accepts it as a biological fact, another manifestation of biology which the scientist encounters at every turn in his explorations. The aim of the Biologist position on this vital issue is therefore acceptance and wonder, not critical argument.

For man's view of himself the Biologist position has at least this much to offer. The mystery of man is biological and shared by him with other complex organizations which are never comprehended in their totality

but only piecemeal. Man's brain is so constructed that piece by piece he apprehends the whole through the operations of coding and recoding. Languages and cultures, i.e. coded verbal and non-verbal constructions, are constituted of these pieces and, due to a means-ends reversal, also a biological process, begin to live lives of their own:

What happens when a man, or for that matter an animal, has no need to work for a living?... the simplest case is that of the domesticated cat – a paradigm of affluent living more extreme than that of the horse or the cow. All the basic needs of a domesticated cat are provided for almost before they are expressed. It is protected against danger and inclement weather. Its food is there before it is hungry or thirsty. What then does it do? How does it pass its time?

We might expect that having taken its food in a perfunctory way it would curl up on its cushion and sleep until faint internal stimulation gave some information of the need for another perfunctory meal. But no, it does not just sleep. It prowls the garden and the woods killing young birds and mice. It *enjoys* life in its own way. The fact that life can be enjoyed, and is most enjoyed, by many living beings in the state of affluence (as defined) draws attention to the dramatic change that occurs in the working of the organic machinery at a certain stage of the evolutionary process. *This is the reversal of the means-end relation in behavior.* In the state of nature the cat must kill to live. In the state of affluence it lives to kill. This happens with men. When men have no need to work for a living there are broadly only two things left to them to do. They can 'play' and they can cultivate the arts. These are their two ways of enjoying life. It is true that many men work because they enjoy it, but in this case 'work' has changed its meaning. It has become a form of 'play'. 'Play' is characteristically an activity which is engaged in for its own sake – without concern for utility or any further end. 'Work' is characteristically activity in which effort is directed to the production of some utility in the simplest and easiest way. Hence the importance of ergonomics and work study – the objective of which is to reduce difficulty and save time. In play the activity is often directed to attaining a pointless objective in a difficult way, as when a golfer, using curious instruments, guides a small ball into a not much larger hole from remote distances and in the face of obstructions deliberately designed to make the operation as difficult as may be. This involves the reversal of the means-end relation. The 'end' – getting the ball into the hole – is set up as a *means* to the new end, the real end, the enjoyment of difficult activity for its own sake (Mace, 1961, p. 10-11).

Thus the means-ends reversal compounds complexity and the original organizing potential can easily be lost sight of. Biological processes have built in renewal mechanisms, however. When the acculturated structures begin to become too cumbersome or too conflicting with each other they are often degraded, pruned back to their more essential roots. Clearer vision is then attained of the basic organization which gave rise to the process initially because now historical comparison can be made between the primitive and the sophisticated realization of the process.

Thus gradually wisdom is attained. In contrast to the cries of woe that are increasingly heard as we approach the new millenium, the biologist immersed in the study of brain process comes up hopeful. True, we must get on with the job before some of the cultural structures that have suffered the means-ends reversal overwhelm their creators. But the evidence suggests that remedial 'counter' cultures will quickly become constituted by the same sorts of brains that initiated the original. The power of this peculiar biological organ, especially in man, to 'mind' the physical universe is only beginning to be engaged.

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